

CLAIMS

1. An electroluminescent element comprising:
a pair of electrodes facing each other; and
at least one phosphor layer formed between the pair of electrodes,
wherein the phosphor layer includes a phosphor semiconductor with a wide band-gap.
2. The electroluminescent element according to claim 1, wherein the phosphor layer has a laminated structure of a phosphor layer and a semiconductor layer with wide band-gap.
3. The electroluminescent element according to claim 2, further comprising at least one transparent conductive layer interposed between the pair of electrodes.
4. The electroluminescent element according to claim 3, wherein the transparent conductive layer is a partially discontinuous layer.
5. The electroluminescent element according to any one of claims 2 to 4, wherein at least one of the phosphor layer and the semiconductor layer constituting the phosphor layer is a partially discontinuous layer.
6. The electroluminescent element according to claim 1, wherein the phosphor layer includes a phosphor particle in each of which at least a part of a surface thereof is covered with a semiconductor having a wide band-gap.

7. The electroluminescent element according to claim 1, wherein the phosphor layer includes a phosphor particle in each of which substantially all surface thereof is covered with a semiconductor having wide band-gap.

8. The electroluminescent element according to claim 1, wherein the phosphor layer is so configured that the phosphor particles, in each of which at least a part of a surface thereof is covered with a semiconductor having wide band-gap, are dispersed in a matrix material.

9. The electroluminescent element according to claim 1, wherein the phosphor layer is so configured that the phosphor particles, in each of which substantially all surface thereof is covered with a semiconductor having a wide band-gap, are dispersed within a matrix material.

10. The electroluminescent element according to claim 8 or 9, wherein the matrix material is a transparent conductor.

11. The electroluminescent element according to any one of claims 1 to 10, wherein the semiconductor constituting the phosphor layer has a band-gap causing to emit light of a shorter wavelength than blue light by applying an electric field.

12. The electroluminescent element according to any one of claims 1 to 10, wherein the semiconductor constituting the phosphor layer has a band-gap of

2.0eV or more.

13. The electroluminescent element according to any one of claims 1 to 10, wherein the semiconductor constituting the phosphor layer has a band-gap of 2.5eV or more.

14. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a main component thereof is a 13th-15th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

15. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a main component thereof is a 12th-16th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

16. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a main component thereof is a 2nd-16th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

17. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a main component thereof is a 12th-13th-16th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

18. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a main component thereof is a 11th-13th-16th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

19. The electroluminescent element according to any one of claims 11 to 13, wherein the semiconductor is so configured that a 12th-14th-15th group compound semiconductor, a mixed crystal thereof, or a mixture thereof in which a partial segregation is allowed.

20. The electroluminescent element according to any one of claims 1 to 19, further comprising an electron transport layer between the phosphor layer and at least one of the electrodes.

21. The electroluminescent element according to any one of claims 1 to 20, wherein the pair of electrodes are positive electrode and negative electrode.

22. The electroluminescent element according to claim 21, wherein at least one semiconductor layer constituting the phosphor layer is located nearer the negative electrode side than the phosphor layer.

23. The electroluminescent element according to any one of claims 1 to 22, further comprising a thin film transistor connected with one of the pair of electrodes.

24. A display device comprising:

an electroluminescent array in which electroluminescent elements according to claim 23 are arranged in two dimensions;

a plurality of x electrodes, in parallel with each other, extending in a first direction in parallel with a face of the electroluminescent array; and

a plurality of y electrodes extending in parallel with a second direction, orthogonal to the first direction, in parallel with the face of the electroluminescent array, wherein the thin film transistor of the electroluminescent array is connected with the x electrode and the y electrode, respectively.